CLAIMS

1. A method for obtaining a desired level of diffusivity of acoustic output from an acoustic device, comprising the steps of measuring at least two responses of the acoustic device, one response being a reference response, calculating the correlation between each measured response and the reference response, varying at least one parameter of the acoustic device, remeasuring said at least two responses and calculating the correlation between the remeasured reference response and the other remeasured responses for each variation, and selecting the or each parameter of the acoustic device which gives a correlation closest to a predetermined optimum value so that the desired diffusivity is obtained.

2. A method according to claim 1, wherein the responses being correlated are impulse or frequency responses.

3. A method according to claim 2, wherein the responses are filtered to reduce the frequency range of the responses to be correlated.

4. A method according to claim 1 or claim 2, wherein the correlation calculation uses a correlation coefficient (CC) which represents the expectation value of the product of two signals, and given by the equation:

$$CC_{xy} = \int_{0}^{\infty} X(t) \cdot Y(t) dt$$

where x(t), y(t) are the time traces and X(t), Y(t) are the same traces normalised to give an root mean square level of 1.

5. A method according to claim 4, wherein the correlation calculation uses a general cross correlation function (CCF) given by the equation:

$$CCF_{xy}(\tau) = \int_{-\infty}^{\infty} X(t) \cdot Y(t+\tau) dt$$

where the CC is given as a function of a time delay τ applied to one of the signals.

6. A method according to claim 5, wherein the correlation is calculated for each response in a polar data set and displayed as a correlation polar plot.

7. A method according to claim 6, wherein the mean correlation level of each correlation polar plot is calculated and is further plotted as a function of frequency.

8. A method according to claim 6, where the correlation polar plot is obtained by the steps of choosing a single reference angle, calculating the correlation between the response at the reference position and another position of the polar data set, repeating the correlation calculation for every measured response of the polar data set to form a set of correlation responses, and displaying the maximum value of the correlation as a function of angle.

9. A method according to claim 4, wherein the correlation is calculated for each response in a polar data set and displayed as a correlation polar plot.

10. A method according to claim 9, wherein the mean correlation level of each correlation polar plot is

calculated and is further plotted as a function of frequency.

11. A method according to claim 9, where the correlation polar plot is obtained by the steps of choosing a single reference angle, calculating the correlation between the response at the reference position and another position of the polar data set, repeating the correlation calculation for every measured response of the polar data set to form a set of correlation responses, and displaying the maximum value of the correlation as a function of angle.

12. A method according to claim 2, wherein the correlation is calculated for each response in a polar data set and displayed as a correlation polar plot.

13. A method according to claim 12, wherein the mean correlation level of each correlation polar plot is calculated and is further plotted as a function of frequency.

14. A method according to claim 12, where the correlation polar plot is obtained by the steps of choosing a single reference angle, calculating the correlation between the response at the reference position and another position of the polar data set, repeating the correlation calculation for every measured response of the polar data set to form a set of correlation responses, and displaying the maximum value of the correlation as a function of angle.

15. A method according to claim 1, wherein the correlation is calculated for each response in a polar data set and displayed as a correlation polar plot.

16. A method according to claim 15, wherein the mean correlation level of each correlation polar plot is calculated and is further plotted as a function of frequency.

17. A method according to claim 15, where the correlation polar plot is obtained by the steps of choosing a single reference angle, calculating the correlation between the response at the reference position and another position of the polar data set, repeating the correlation calculation for every measured response of the polar data set to form a set of correlation responses, and displaying the maximum value of the correlation as a function of angle.

18. A method for obtaining a desired level of diffusivity of acoustic output from a bending wave acoustic device comprising a panel member for radiating acoustic output and a transducer for exciting bending waves in the panel member, the method comprising the steps of measuring at least two responses of the acoustic device, one response being a reference response, calculating the correlation between each measured response and the reference response, varying at least one parameter of the acoustic device, remeasuring said at least two responses and calculating the correlation between the remeasured reference response and the other remeasured responses for each variation, and selecting the or each parameter of the acoustic device which gives a correlation closest to a predetermined optimum value so that the desired diffusivity is obtained.

19. A method according to claim 18, wherein the parameters that can be varied are selected from the group consisting essentially of the geometry of the panel member, the stiffness of the panel member, the areal mass density of the panel member, damping of the panel member, the location and type of a bending wave transducer on the panel member and the relative phase connections of transducer pairs.

20. A method according to claim 19, wherein the geometric parameters are selected from the group consisting essentially of the surface area of the panel member and the aspect ratio of the panel member.

21. A method according to claim 18, wherein the responses being correlated are impulse or frequency responses.

22. A method according to claim 21, wherein the responses are filtered to reduce the frequency range of the responses to be correlated.

23. A method according to claim 18 or claim 21, wherein the correlation calculation uses a correlation coefficient (CC) which represents the expectation value of the product of two signals, and given by the equation:

$$CC_{xy} = \int_0^\infty X(t) \cdot Y(t) dt$$

where x(t), y(t) are the time traces and X(t), Y(t) are the same traces normalised to give an root mean square level of 1.

24. A method according to claim 23, wherein the correlation calculation uses a general cross correlation function (CCF) given by the equation:

$$CCF_{xy}(\tau) = \int_{-\infty}^{\infty} X(t) \cdot Y(t+\tau) dt$$

where the CC is given as a function of a time delay τ applied to one of the signals.

25. A method according to claim 24, wherein the correlation is calculated for each response in a polar data set and displayed as a correlation polar plot.

26. A method according to claim 25, wherein the mean correlation level of each correlation polar plot is calculated and is further plotted as a function of frequency.

27. A method according to claim 25, where the correlation polar plot is obtained by the steps of choosing a single reference angle, calculating the correlation between the response at the reference position and another position of the polar data set, repeating the correlation calculation for every measured response of the polar data set to form a set of correlation responses, and displaying the maximum value of the correlation as a function of angle.

28. A method according to claim 23, wherein the correlation is calculated for each response in a polar data set and displayed as a correlation polar plot.

29. A method according to claim 28, wherein the mean correlation level of each correlation polar plot is

calculated and is further plotted as a function of frequency.

30. A method according to claim 28, where the correlation polar plot is obtained by the steps of choosing a single reference angle, calculating the correlation between the response at the reference position and another position of the polar data set, repeating the correlation calculation for every measured response of the polar data set to form a set of correlation responses, and displaying the maximum value of the correlation as a function of angle.

31. A method according to claim 21, wherein the correlation is calculated for each response in a polar data set and displayed as a correlation polar plot.

32. A method according to claim 31, wherein the mean correlation level of each correlation polar plot is calculated and is further plotted as a function of frequency.

33. A method according to claim 31, where the correlation polar plot is obtained by the steps of choosing a single reference angle, calculating the correlation between the response at the reference position and another position of the polar data set, repeating the correlation calculation for every measured response of the polar data set to form a set of correlation responses, and displaying the maximum value of the correlation as a function of angle.

34. A method according to claim 18, wherein the correlation is calculated for each response in a polar data set and displayed as a correlation polar plot.

35. A method according to claim 34, wherein the mean correlation level of each correlation polar plot is calculated and is further plotted as a function of frequency.

36. A method according to claim 34, where the correlation polar plot is obtained by the steps of choosing a single reference angle, calculating the correlation between the response at the reference position and another position of the polar data set, repeating the correlation calculation for every measured response of the polar data set to form a set of correlation responses, and displaying the maximum value of the correlation as a function of angle.

37. A method for measuring the spatial diffusivity of acoustic output from an acoustic device, comprising measuring the response of the acoustic device at a reference position and at a comparison position, and calculating the correlation between the response at the reference and the comparison positions to provide a measure of the diffusivity.